

REMARKS/ARGUMENTS

The Office Action mailed January 5, 2007 has been received and reviewed. Claims 10-19, 21-28, 45-55, and 57-67 are currently pending in the application. Claims 10-19, 21-28, 45-55, and 57-67 stand rejected. Claims 11-13, 22-28, 46-52, and 57-63 are canceled without prejudice or disclaimer.

Applicants have amended claim 10 to recite that the etch solution consists of tetramethylammonium hydroxide ("TMAH") and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, ethylene glycol, propylene glycol, glycerin, and mixtures thereof. Each of claims 14-17 have been amended to improve antecedent basis and to recite the transitional phrase "consisting of." Claims 18, 45, and 55 have been amended to recite that the etch solution comprises TMAH and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, ethylene glycol, glycerin, and mixtures thereof. Each of claims 19 and 21 has been amended to improve the clarity of the claims. Support for the amendments is found in the as-filed specification at least at paragraphs [0018] and [0025]. No new matter has been added.

Applicants respectfully request reconsideration of the application as amended and in light of the arguments presented herein.

Claim Objections

Claims 11-17, 19, 22-28, 46-54, 55, and 57-63 are objected to due to alleged informalities in the claim language.

The objection to each of claims 11-13, 22-28, 46-52, and 57-63 is moot, as each of these claims has been canceled.

Regarding claims 14-17 and 19, it is respectfully submitted that the claim language objected to by the Examiner is proper because the language utilizes proper antecedent basis for the recited method limitations. In particular, the objected-to language in each of claims 14-17 and 19 recites the specific method limitation of the respective independent claim from which it depends. Since the language provides clarity to the claims and the scope of the claims would be

reasonably ascertainable to a person of ordinary skill in the art, it is respectfully requested that the claim objections be withdrawn.

Claims 53 and 54 do not recite “an etch solution” and “at least one organic solvent” and, therefore, do not recite the language objected to by the Examiner.

Claim 55 was previously amended (see response filed November 6, 2006) to include “a first etch solution” and, therefore, does not recite the language objected to by the Examiner.

In light of these arguments, the objection to claims 14-17, 19, and 53-55 should be withdrawn.

35 U.S.C. § 102(e) Anticipation Rejections

Anticipation Rejection Based on U.S. Patent No. 6,912,081 to Bolle *et al.*

Claims 10-13 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,912,081 to Bolle *et al.* (“Bolle”). Applicants respectfully traverse this rejection, as hereinafter set forth.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Bolle describes forming a hard mask 103 on a substrate 101, such as silicon, to define a pattern of mesas. Bolle, column 2, lines 25-29. The hard mask 103 is formed from silicon nitride or silicon dioxide. *Id.*, column 4, lines 56-57. The mesas 105 are formed by etching unmasked portions of the substrate 101 using TMAH mixed with nonylphenol ethoxy ether. *Id.*, column 4, lines 60-67.

Applicants respectfully submit that Bolle does not anticipate independent claim 10 because Bolle fails to disclose, either expressly or inherently, each and every element of amended claim 10. Specifically, Bolle does not expressly or inherently describe the element of “exposing a silicon layer on a semiconductor substrate to an etch solution consisting of tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent selected from the

group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, propylene glycol, ethylene glycol, glycerin, and mixtures thereof.” Rather, Bolle is limited to describing an etchant that includes a mixture of TMAH and a surfactant, such as nonylphenol ethoxy ether. The Examiner suggests that the disclosure of nonylphenol ethoxy ether in Bolle describes “phenol,” thus anticipating amended independent claim 10. *See* Office Action of January 5, 2007, p. 4. However, claim 10 does not recite “a phenol” but rather, the compound “phenol.” Since Bolle does not describe phenol, but rather describes the phenol-containing compound nonylphenol ethoxy ether, Bolle does not expressly or inherently describe that its etchant includes TMAH and the organic solvents recited in claim 10.

Because the description of Bolle is limited to nonylphenol ethoxy ether, Bolle does not expressly or inherently describe each and every element of amended independent claim 10. Thus, the anticipation rejection of claim 10 under 35 U.S.C. § 102(e) is improper and should be withdrawn.

The rejection of claims 11-13 is moot, as each of these claims has been canceled.

Anticipation Rejection Based on U.S. Publication No. 2005/0104228 to Rigg *et al.*

Claims 18-19, 21-28, 45-55, 57-64, and 67 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Publication No. 2005/0104228 to Rigg *et al.* (“Rigg”). Claims 22-28, 46-52, and 57-63 have been canceled, rendering moot the rejection as to these claims. Applicants respectfully traverse this rejection as to the remaining claims, as hereinafter set forth.

Rigg describes removing “slag” from a through-hole 264 formed in a silicon die 212 by laser cutting. Rigg at paragraphs [0033] and [0034]. Rigg describes using a cleaning agent to remove the slag without damaging the metal of the bond-pad 216. *Id.* One example of the cleaning agent includes 6% TMAH and propylene glycol. *Id.*

Rigg does not expressly or inherently describe the element of “removing a HAZ on a silicon substrate without removing at least one of an exposed oxide layer and an exposed nitride layer present on the silicon substrate by exposing the silicon substrate to an etch solution comprising tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol,

ethylene glycol, glycerin, and mixtures thereof,” as recited in amended claim 18. Since Rigg describes a mixture of TMAH and propylene glycol, Rigg does not describe removing slag using an etch solution that includes TMAH and the recited organic solvents.

Because Rigg does not expressly or inherently describe each and every element of claim 18, the anticipation rejection is improper and should be withdrawn.

Claims 19 and 21 are each allowable, *inter alia*, as depending from an allowable base claim.

Claim 21 is further allowable because Rigg does not expressly or inherently describe the element of “removing at least a portion of the silicon substrate other than within the HAZ using the etch solution.” The Examiner asserts that “the etch solution inherently remov[es] at least a portion of the silicon substrate.” *See* Office Action of January 5, 2007, page 5. Applicants note that the burden is on the Office to demonstrate that a reference teaching is inherent. The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish inherency of that result or characteristic. M.P.E.P. § 2112. Because the Examiner has not provided any support for the assertion of inherency, the rejection of claim 21 is improper and should be withdrawn.

Rigg does not expressly or inherently describe the element of “exposing the silicon substrate to an etch solution comprising tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, ethylene glycol, glycerin, and mixtures thereof,” as recited in amended claim 45. Rather, Rigg describes a mixture of TMAH and propylene glycol as described hereinabove with respect to claim 18.

Because Rigg does not anticipate each and every element of claim 45, the anticipation rejection should be withdrawn.

Each of claims 53 and 54 is allowable, *inter alia*, as depending from an allowable base claim.

Claim 54 is further allowable because Rigg fails to expressly or inherently describe the element of “removing at least a portion of the silicon substrate with the etch solution,” as described hereinabove with respect to claim 21.

Rigg does not expressly or inherently describe the element of “removing the HAZ without removing at least one of an exposed oxide layer and an exposed nitride layer present on the silicon substrate by exposing the silicon substrate to a first etch solution comprising tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, ethylene glycol, glycerin, and mixtures thereof,” as recited in amended claim 55. Rather, Rigg describes a mixture of TMAH and propylene glycol as described hereinabove with respect to claim 18.

Because Rigg does not anticipate each and every element of presently amended claim 55, the anticipation rejection should be withdrawn.

Claims 64 and 67 are each allowable, *inter alia*, as depending from an allowable base claim.

Thus, withdrawal of the 35 U.S.C. § 102(e) obviousness rejections of claims 18, 19, 21, 45, 53-55, 64, and 67 is respectfully solicited, as is allowance of each of these claims.

35 U.S.C. § 103(a) Obviousness Rejections

Obviousness Rejection Based on Bolle in view of U.S. Publication No. 2005/0065050 to Starzynski

Dependent claims 14-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Bolle in view of U.S. Publication No. 2005/0065050 to Starzynski (“Starzynski”). Applicants respectfully traverse this rejection, as hereinafter set forth.

The teachings of Bolle are as previously disclosed.

Starzynski teaches silicon etchants that include “at least one of potassium hydroxide or tetramethyl ammonium hydroxide; at least one additive . . . ; and an aqueous environment that comprises at least one solvent or solvent blend.” Starzynski at paragraph [0026]. The additive is a glycol or glycol-based derivative, such as glycerol, glyceride, glycerine, alkylene glycols (ethylene glycol, propylene glycol). *Id.* Starzynski teaches hydrocarbon solvents, such as ketones, carbonate-based compounds, water, ethers, and amines. *Id.*, paragraph [0036].

Since claims 14-17 depend from amended claim 10, each of claims 14-17 includes all of the limitations of claim 10. Bolle does not teach or suggest the limitation of “exposing a silicon

layer on a semiconductor substrate to an etch solution consisting of tetramethylammonium hydroxide (“TMAH”) and at least one organic solvent selected from the group consisting of isopropanol, butanol, hexanol, phenol, glycol, glycerol, propylene glycol, ethylene glycol, glycerin, and mixtures thereof” for substantially the same reasons as previously discussed in the anticipation rejection. Starzynski does not cure the deficiencies of Bolle because the etchant composition in Starzynski includes TMAH in combination with *both* an additive and a hydrocarbon solvent. As such, Starzynski does not teach or suggest that its etchant composition consists of the ingredients recited in claim 10.

Thus, each of claims 14-17 is allowable as depending from claim 10, which is allowable.

Accordingly, withdrawal of the obviousness rejection of claims 14-17 is respectfully requested, as is allowance of each of these claims.

Obviousness Rejection Based on Rigg in view of JP 06-041770 to Takehiko *et al.*

Claims 65 and 66 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Rigg in view of JP 06-041770 to Takehiko *et al.* (“Takehiko”). Applicants respectfully traverse this rejection, as hereinafter set forth.

Applicants respectfully submit that Rigg should be disqualified as a prior art reference under 35 U.S.C. § 103(c) since Rigg constitutes prior art under 35 U.S.C. § 102(e). The above-referenced application was filed on March 19, 2004, which predates the May 19, 2005, publication date of Rigg. With respect to rejections under 35 U.S.C. § 103(a) that are based upon references which qualify as prior art under 35 U.S.C. § 102(e), 35 U.S.C. § 103(c) provides:

Subject matter developed by another person, which qualifies as prior art only under one or more of subsections (e), (f), and (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Applicants respectfully submit that at the time the invention disclosed in the above-referenced application was made, the claimed invention was owned by, or subject to an obligation of assignment to, Micron Technology, Inc., as evidenced by the assignment recorded

at Reel No. 015125, Frame No. 0095. Micron Technology, Inc. is the same party to which Rigg is assigned, as evidenced by the assignment recorded at Reel No. 014710, Frame No. 0875. Since the above-referenced application and Rigg were owned by, or subject to an obligation of assignment to, the same person at the time the invention was made, Rigg is disqualified as prior art under 35 U.S.C. § 103(c). Therefore, Rigg may not be relied upon to reject claims 65 and 66 under 35 U.S.C. § 103(a).

The Examiner relies on Takehiko as teaching a “second etch solution comprising ammonium fluoride, phosphorous acid, water, hydrogen peroxide and at least one organic solvent for cleaning silicon.” *See* Office Action of January 5, 2007, p. 9. However, since Rigg is disqualified as prior art and since Takehiko does not teach or suggest all of the limitations of claim 55, from which claims 65 and 66 depend, the 35 U.S.C. § 103(a) rejection of claims 65 and 66 should be withdrawn.

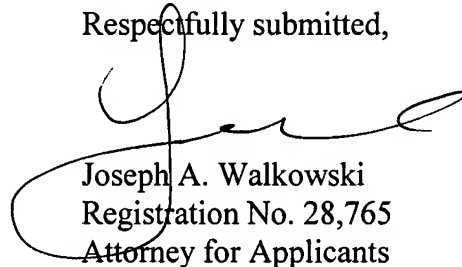
ENTRY OF AMENDMENTS

The amendments to claims 10, 14-19, 21, 45, and 55 should be entered by the Examiner because the amendments are supported by the as-filed specification and drawings and do not add any new matter to the application.

CONCLUSION

Claims 10, 14-19, 21, 45, 53-55, and 64-67 are believed to be in condition for allowance, and an early notice thereof is respectfully solicited. Should the Examiner determine that additional issues remain which might be resolved by a telephone conference, the Examiner is respectfully invited to contact Applicants' undersigned attorney.

Respectfully submitted,



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